REMARKS/ARGUMENTS

Subsequent to entry of the present amendment claims 1 – 11 and 27 will be pending and at issue in the present application. The amendments and additions add no new matter as the claim language is fully supported by the originally filed specification and claims.

By the present amendment, claims 1-11 and 27 are presented for further prosecution. Claims 12-26 have been previously withdrawn as being drawn to a non-elected invention. Claim 1 is amended herein to clarify that the artificial tissue comprises a "hydrogel". In amended claim 1, the term "matrix" has been replaced by the term "hydrogel". This amendment does not alter the intended scope of claim 1 since the two terms are used interchangeably throughout the specification as originally filed.

With regard to the present application, one of skill in the art would understand that the term "matrix" was intended to refer to a "hydrogel", since all of the "matrices" described and specifically prepared fall within the definition of hydrogel provided at page 7, lines 8-10 of the specification. Further support for the interchange-ability of these terms can be found, for example, in the section starting at page 17, line 3, entitled "Preparation of the Bio-Synthetic Matrix", which describes a process for preparing a "hydrogel"; in Example 1 (starting at page 29, line 8), which discloses the preparation and testing of various hydrogels of the invention; in Example 2 (starting at page 39, line 17), which discloses the preparation and testing of engineered innervated artificial corneas made from a "collagen-containing hydrogel"; and in Example 3 (starting at page 46, line 10), which discloses fibrin-containing matrices and are also referred to as "gels" (see, e.g., page 49, line 22) and "hydrogels" (see, e.g., page 51, line 3), and their use in artificial tissues.

Claim 1 is further amended herein to specify that the recited nerve cells are within the bio-synthetic hydrogel. Support for artificial tissues with nerve cells "within" the component hydrogel can be found, for example, at page 21, line 21 to page 22, line 12 of the specification and in all three Examples (see, e.g., page 36, line 24 - page 37, line 15; page 38, line 16 - page

39, line 16; page 40, line 5 - page 41, line 13; page 46, lines 5 - 9; and page 49, line 20 - page 50, line 4). No new matter has been added.

A Request for Continued Examination (RCE) under 37 CFR §1.114 accompanies this response.

Claim Rejections - 35 U.S.C. §102

Claims 1, 2, 3 and 7-11 have been rejected under 35 U.S.C. §102(b) as allegedly being anticipated by Jacob et al (US 2002/0007217). Applicants respectfully disagree.

As amended herein, the invention as defined by the claims, distinguishes over Jacob by claiming an innervated artificial tissue having a plurality of functional nerve cells within a bio-synthetic hydrogel.

Jacob does not disclose any such tissue. Instead, this reference discloses a synthetic device for cornea replacement that includes corneal enhancement molecules, specifically, extracellular matrix proteins, corneal growth factors and other ligand-specific corneal enhancer molecules on the polymeric surface of an optical polymer wherein the epithelial cell response can be significantly enhanced. The optical polymer can include collagen, poly(2-hydroxyethylmethacrylate), polymethacrylic acid or combinations thereof. Jacob also discloses examples of ligand-specific corneal enhancer molecules that can be used in the disclosed device include the neurotransmitter, substance P, and fibronectin adhesion-promoting peptide sequences consisting of YIGSR. This reference, however, does not disclose any innervated artificial tissues having functional nerve cells within a bio-synthetic hydrogel as required by the claimed invention.

The Action suggests that implantation of the device of Jacob that includes substance P and YIGSR would allegedly inherently include cellular ingrowth of both nerve and non-nerve cells. Applicants respectfully disagree.

Jacob discloses a synthetic device that includes only surface modified polymers. The surface modification acts to promote epithelial cell adhesion and migration in forming an

epithelial layer over the polymer (see, e.g., page 6, paragraph 45). The disclosed device includes an optical polymer (preferably a hydrogel) that is surface modified using "tethers" that serve as links between the surface of the optical polymer and corneal enhancer molecules (see, e.g., page 6, paragraph 47). The use of the tethers apparently reduces interference from non-specific, passively adsorbed molecules on the hydrogel surface in the "function of the tethered molecules in enhancing epithelial cell attachment to the tether-modified hydrogel surfaces." (See, page 7, paragraph 49) The Examples provided in Jacob merely demonstrate the formation of an epithelial layer over the hydrogel surfaces; there is no description or demonstration of any cellular ingrowth, let alone nerve cell ingrowth.

The Action also refers to the disclosure at page 2, paragraph 12 of Jacob in support of the position that Jacob allegedly discloses inherent cellular ingrowth into the disclosed device. Applicants respectfully submit, however, that the disclosure at page 2, paragraph 12 of Jacob merely references the fact that the cornea is heavily innervated and that this innervation plays a role in the maintenance of the normal structure and functions of the cornea and in the wound healing process. This disclosure in no way relates to innervation of the disclosed synthetic device for cornea replacement. The synthetic device of Jacob was developed to overcome the problem with previous devices in which there were difficulties in forming a viable confluent layer of corneal epithelial cells across the anterior surface of the optical material (see, page 3, paragraph 17). As such, the device of Jacob was not developed to support nerve cell ingrowth. In fact, there is no disclosure within Jacob that innervation of the synthetic device is possible or even desirable.

The synthetic device of Jacob does not disclose an innervated artificial tissue having a plurality of functional nerve cells within a bio-synthetic hydrogel and therefore, would not be expected to support functional nerve cell ingrowth following implantation. Accordingly, Applicants respectfully submit that claim 1 is not anticipated by Jacob.

Dependent claims 2, 3 and 7-11 recite additional features of the invention and therefore, are not anticipated by Jacob for the same reason recited above with respect to claim 1.

Applicants respectfully request that the rejection of claims 1, 2, 3 and 7-11 under 35 U.S.C. §102(b) for anticipation be withdrawn.

Claim Rejections - 35 U.S.C. §103

Simpson et al

Claims 1-3, 7-9, 11 and 27 have been rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Simpson et al (US 2002/0090725). Applicants respectfully disagree.

As amended herein, the invention as defined by the claims, distinguishes over Simpson by claiming an innervated artificial tissue having a plurality of functional nerve cells within a bio-synthetic hydrogel.

Simpson does not teach or suggest any such tissue. Instead, this reference teaches the formation of an engineered tissue using collagen, as an extracellular matrix, with cells and synthetic matrix materials that include poly(acrylic acid) and other similar synthetic polymers. This reference, however, does not teach or suggest any innervated artificial tissues having functional nerve cells within a bio-synthetic hydrogel as required by the claimed invention.

The Action concedes that while Simpson does not disclose the presently claimed artificial tissue in a "single embodiment", it has taken the position that the claimed invention as a whole was allegedly obvious since all of the claimed limitations are taught and suggested by Simpson. Applicants respectfully disagree.

The collagen used in preparing the engineered tissue of Simpson is electroprocessed and all of the examples make use of electrospun collagen. The matrices prepared using the electroprocessed collagen in Simpson are not hydrogels as demonstrated by the Figures in this reference, which show that the electrospun collagen forms discrete fibrils that combine to make meshes rather than gels. There is no teaching or suggestion in Simpson of any innervated artificial tissues having functional nerve cells within a bio-synthetic hydrogel as required by the claimed invention.

Dependent claims 2, 3, 7-9, 11 and 27 recite additional features of the invention and therefore, are not rendered obvious by Simpson for the same reasons recited above with respect to claim 1.

Applicants respectfully request that the rejection of claims 1-3, 7-9, 11 and 27 under 35 U.S.C. §103(a) for obviousness be withdrawn.

Simpson in view of Chaouk et al, Moussy et al, and Clapper et al

Claims 4-6 have been rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Simpson as applied to claims 1-3, 7-9, 11 and 27 and further in view of Chaouk et al (US 6,225,367), Moussy et al (US 6,497,729) and Clapper et al (US 6,514,734). Applicants respectfully disagree.

As amended herein and discussed above, the invention as defined by the claims, distinguishes over Simpson by claiming an innervated artificial tissue having a plurality of functional nerve cells within a bio-synthetic hydrogel.

The Action has relied on Chaouk, Moussy and Clapper for their teaching of specific synthetic polymers as being suitable for use in corneal implants. However, none of these references cure the deficiencies of Simpson as recited above. Accordingly, Applicants assert that claims 4-6 are not rendered obvious by Simpson in combination with Chaouk, Moussy and Clapper for the reasons recited above in respect of Simpson.

Applicants respectfully request that the rejection of claims 4-6 under 35 U.S.C. §103(a) for obviousness be withdrawn.

Simpson in view of Jacob

Claim 10 has been rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Simpson as applied to claims 1-9, 11 and 27 and further in view of Jacob. Applicants respectfully disagree.

As amended herein and discussed above, the invention as defined by the claims, distinguishes over Simpson by claiming an innervated artificial tissue having a plurality of functional nerve cells within a bio-synthetic hydrogel.

The Action has relied on Jacob for the teaching of the use of YIGSR as a bioactive agent. Applicants assert that Jacob does not cure the deficiencies of Simpson and that claim 10 is not rendered obvious by Simpson in view of Jacob for the reasons recited above in respect of both Jacob and Simpson.

Applicants respectfully request that the rejection of claim 10 under 35 U.S.C. §103(a) for obviousness be withdrawn.

CONCLUSION

In view of the foregoing amendments and the remarks, it is submitted that the claims are in condition for allowance, and a notice to that effect is respectfully requested. The Examiner is invited to contact Applicants' undersigned representative if there are any questions relating to this case.

The Commissioner is hereby authorized to charge the amount of $810.00 as payment of the Request for Continued Examination fee and the amount of $1,110.00 for a Three-Month Extension of Time fee. No additional fees are believed to be due with the present communication, however, the Commissioner is hereby authorized to charge any fees that may be due in connection with the filing of this paper, or credit any overpayment to Deposit Account No. 07-1896, referencing the above-identified Attorney Docket Number.

Respectfully submitted,

Date: January 8, 2009

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